Menlo Park Notebook #77 [N-79-06-16.1]

This notebook covers the period June-November 1879. Most of the entries are by Francis Upton. Included are notes and calculations relating to tests of the Edison dynamo. There are also a few drawings. Some of the entries are cross referenced to "Book 8." Toward the end of the book are notes and calculations about tests of sewing machine motors. On pages 234-235 are drawings by Edison of the telephone. The label on the front cover is marked "Faradic Machines 2 Tests." The book contains 284 numbered pages.

Missing page numbers: 175-176.

Index No. 79

Size of pulley p. 109 p. 110

Table of speeds p. 150 245

Table of Galvanometers p. 150

Connection for angle of pulley p. 114. 244

Power required to run machine p. 125 p. 209+

Constants of Tom galvs. p. 131

Siemens Strong p. 112-113

Page 161, 179, 219

Tests of Dynamos

LIBRARY OF THE

BOARD OF PATENT CONTROL,

120 BROADWAY, NEW YORK.

[illegible]

[illegible] N.Y.C.

[illegible], 189[illegible].

Results from Book 8 /

Page 91 Small Edison

Speed probably 1120

8 Ohms total 120 Volts

Circuit open	9.75	
50 Ohms	27.7	p. 92
after bringing up to 1120 by adjusting current	54.4 Volts	
30 Ohms	42.6 Volts	
20.5 Ohms	82.9	
11.2	116	p. 93
10.2	114	
7.25	111	

Grimmer on field

15.25 Ohms

123 Volts

89

2

Page 105 table of the results from Gramme

Small new machine

5.9 Ohms 117 Volts ϕ 171

3.09 H.P.

10.1 Ohms 103 Volts ϕ 172

Edison machine coils in three divisions in 3 magnet quantities

1160 revo.

p.176: 2.03 Ohms Total 32.4 Volts ϕ

2.38 28.9

1.76 35.4

2.63 28.9

1.72 37.2

---

540 revo

1.16 Ohms 12.6 Volts

.98 13.4

1.51 10. Volts

1/10 H.P.

---

800 revo. 3

p.188

1.5 4 Ohms	20 Volts	1/3 H.P.
1.0.1	24.7	
2.04	15	
1.02	25.2	

Gramme	1040 revo	
5.14	73.6 Volts	
3.96	85.6	

New machine Gramme on field

on field E.M.F. on R

11 Webers	50.5 Volts	9.1 Ohms
11.	50.4	7.7
8.55	45.7	

Running its own field.

on 6.3 Ohms	59.3	2.214
6.35	63.5	
6.3	62	

Gramme 1040 rev

6.45 Ohms . 74.4 Volts

Gramme on field

Large Edison 26 Rev

Webers on Magnet	E.M.F	Ohms
8.26	60.5	5.32
10.3	57.7	5.4
11.1	53.6	6.3
8.15	42	6.3
1.82	11.2	6.3
14.4	53.2	6.3

Large Edison 26 Rev

5.7 Ohms	62.7 Volts
5.05	62.1
6.3	56
3.95	61.4
5.1	65.7

Large 2

6.14 Ohms	59 Volts
6.1	59.7
7.1	56.4

Gramme on field 262 Rev

Webers on magnet	E.M.F	Ohms
8.3	63.3	24.6
7.86	60.9	45.3
13.3	66.9	45.3
15.8	70.	45.3
20.2	72.1	45.3

June 16 1894

Standard 200

N. 1, 2, 3. 200

The standard had more
neutral solution which
may account for the diffe

cells 50

8

New machine
Grammes on field

50 N over .71 Ohms

2°

4.		.6021
1.09		.0374
Amps	.71	.1487
7.73 Watts		.8882

2°

8.5428	
4.2714	
8882	
2.3732	

9

35.5 revs
105 in 1.33

Total 11.6 Ohms

1° 50'

~~Impedance that first made~~
one use on ~~the~~ one

to 2.1

	436	.3222	
		.6395	.8378
Amp	1.33	9.8761 -11	.8378
		.8378 19	1.7572
6.88 Watts		44.5	1.6484
			3.2782
1° 50'		11 Ohms	4.5.85
			3.2782
	8.5050		1.2403
	4.2525		.8378
	8378		.0645
	2.4147	11.6	1.9023

79.8 Volts

10 June 16 350 rwd

1242 on 1235

2°38' T.T. 9.65

Lies

2.42 .3832 .9088
4.36 .6395 .9088
comp 1.39 9.8861 1.9542
.9088 1.6484
8.11 lies 3.4202
4.5185
1.0983
12.5 dec Ht. Op.
2° 38' 2|8.6676
4.3338
.9088
2.4250
.9088
9.65 .9545
1.8733 78.2 Volts ?

June 16 3245 rwd 11

1.35-2 1.36

3° Total 8.55

48 1.35 (2.81 .4487
096 4.36 .6395
390 comp 1.38 9.8861
384 .9743
60 9.42 Wicker .9320
8.55 1.9063
80.6 Volts
Turn 48 Deflection Doubles
30 8.7188 With 52 = 44 Doubles
4.3593 2.7 .4314
.9743 .6395
2 38.56 9.8861
9.06 .9570
.9320
77.5 Volts ? 1.8890

12

3400 rev

15°5' 1.36

40 Total 7.5

50 // 5°5'

3.1 .4914

4.36 .6395

Conv. 1.33 9.8761

1.0070

7.5 .8751

1.8821 10.1 Meters

76 Volts?

4° 8.86435

4.42x17

1.0070

2.4147

13

174 Total 6.35

4°44'

5°38'
187 ℄ Total 5.4
revolutions per minute

revolutions per minute
210 rpm 5° 33' on Governor

187
5° 35' Total 4.8
Belt slipping very badly
#1

16

$5^{0}\ 33'$ on Gramme

200 − 203 Total 4.75 Ohms

348 resistance $5^{0}\ 33'$ on Gramme 17

124 L Gramme 1080 revs

363 running feet without Gramme

123

Total 10 Ohms

47 | 124 — 2.0924

47 — 1.6721

.4213

436 — .6395

Comp. 1.13 — 9.8861

.9469 — 8.85 Webers

88.5 Volts

$5^{0}\ 33$ — 8.9854

4.4927

2.4850

.9977 — 9.94 Webers

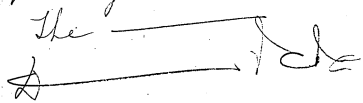
18

66 L

Total 19:3 Thurs

4 rolls Daniells 46 L
47 R

Better taken a gradually fall from beginning



New shoulder 19

next to smallest

2 Daniells 00 R

7 L 10 10

Given 1.32

1.4 .1461

4.36 .6395

Comp 1.28 .8928

678.4 4.77

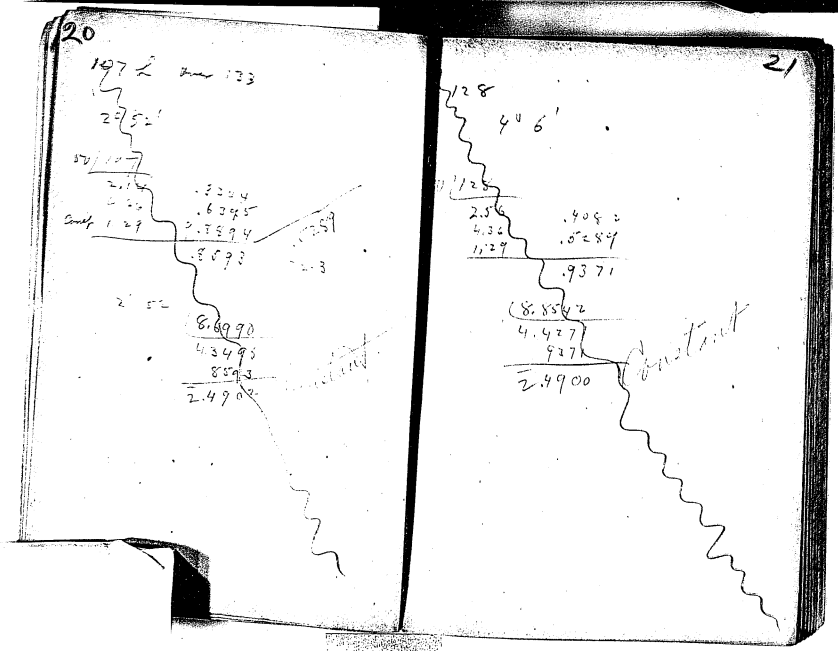
10 10

18308.7

4115.43

1.67821

2.3759 Christian


20
197 2
133
2 5 2'
.33324
.63945
2.55994
.55693
8.69990
4.34995
.85593
2.49002
21
128
4° 6'
2.56
4.36
11.29
.4082
.05289
.9371
8.85542
4.427
927
2.4900

92

142

1.6247

50 | 142

284

.4533
.5289
.9822

440'

(89211
4.4605
.9822
2.4683

93

256

5° 50'

1150

3.0

1.71

.4771
.5289
32
1.0092

(90072
4.8035
.0092
2.4943

Constant = 2.4903 Log

94 New Chevrolet

3° 3·0 on field (340 revs

90 L 1.3

Total 12.2

3° 30 | 8.7855 | 4.3928 | 2.4900 | .8028 | 6,3,5 Watts on Field

50 / 90 | 1.8 | 4.5185 − 3.2082 = 1.3103 | .2553 | .5829 | .8282 | .0564 | .7246 | 84.1 Volts | 12.2 | 6.89 Watts | .8028 | .8028 | 9 | 44.5 | 1.6484 | 3.2082

3° 20 on field

96 L 340 revs from magnet over 1.3 | 12.2

8.9682 | 4.4841 | 2.4900 | .9941 | 4.5185 | 3.5908 | .9279 | 8.47 HP | .9941 | .9941 | .9542 | 1.6484 | 3.5908 | 1.6484 | 9.8 Watts

50 / 96 | 1.72 | .2833 | .5829 | .8662 | .0864 | .9526 | 7.35 | 89.6 Volts | 12.2

96

10 sr on field

74 340 revs Total 12. Ohms

10 .6483
10 .6483
1.6026
2.8992
4.5185
7.6193

8.2766
4.1383
2.4900
.6483

4.45 Meters

141.6 per H.P.

5 | 74
1.48

.1703
.0660
.2363
1.0792
1.3759
.1703
.5829
.7532
12 1.0792
1.8324

5.66

340 revs

68 Volts

97

340 revs

31' on field

Total 11.9 Ohms

60

31'
.4875
.4875
1.6026
2.3776
4.5185
1.9409
87.3 per H.P.

7.9550
3.9775
2.4900
.4875

3.07

5 | 60
1.2

.0792
.5829
.6621
.0755
.7376

11.9

4.59

340 revs

54.6 Volts

28

3.07	.4871
3.07	.4871
44.5	1.6484
410 ft lbs	2.6126

33000 4.5185
2.6126
1.9059

80.5 field magnets for a Horse power assuming 1 Ohm in magnet 5.46 Volts
in reality .9 Ohm
Ro 87.3 per H.P.

June 16 1899 P. 29

Gramme on field.
through galva. 340 revs
22 on 1.28 — 125

Field brought up 340 revs
40 121 3.05 Ohms Total

50 122
.44
436
1,25

7.6435	
.6396	.5426
9.9031	1.53 Ohms
0.1861	.1861
	.1861
40 1.2	1.6026
8.8647	1.9948
4.4323	4.5185
2.4704	2.5237
.9623 917	334 den 4.0
.4845	
1.4468	
2	
1.4268	26.7

27.9 Volts
365

30

2 340 rev

30 = 1.39 - .5 = 1.28

30 10' over 4.57

7.7782
.5426 Fuld
.3208 2.09 Webers

30 10' 8.7422
4.57 4.1711
4.6599
5.8310
2.4700
1.5618 36.4 Volts

340 rev

31

128 on 2.25 Ohms

4041 over 5.7 Ohms

90/126
2.5 2

Comp

2.5 4014
$.36 .5263
2.225 .46478 - 2
.8755 3.767
.5755
4.45 1,64584
2.7994 279
33 rev 4.5185
1.7192 5.7 per H.P

8.9119
#4.1455 9
5.7 .7559
52118
2.4700
.7418
2w
.7218

55.2 Volts
or
52.7 Volts

32

107° over Total in Armature amounts 9.2 Ohms

1° = ~~4.57~~

am 2.25 Ohms

34 over 32'

Total 5.87

Fill there the magnet brought up

50/182

	8.64	.5611
	4.28	.6314
Comp	2.25	9.6478
		.8403
	9.2	.9638
		1.8041

6.92 Webers

63 Volts on Armature

6° 32' 9.0560

4.5280 - 5

2.4700

1.0580

11.4 Webers

5.87 .7686

.8403 1.8266

.8403

67.1 Volts on Self Mutual

Magnet not brought up 33

Total in Armature circuits 5.1

127 over 1.74

5° 35'

Total 5.72

50/127

	2.54	.4048
	4.28	.6314
Comp	1.74	9.7895
		.7957
	8.1	.9085
		1.7042

6.24 Webers

50.6

5° 35' 8.9880

4.4940

2.4700

1.0240

5.72 .7574

1.7814

60.4 Volts

34 Magnetic brought up

150' over 177

1° 32'

Shoulder constants

2R constants

35

2R over 120

3°-5-0

5" 1.45
2.5
4.36
comp 1.29

.3979
.6395
.9031
1.9405

8 25 25
4.43 25
1.9479
2.4770

147 over 1.3

5°28'

567 Total

50 147
1.9

1.9 .2788
4.36 .6395
1.26 .9996
.0779

18.9722
4179
4.14861
1.81179
.4682

36 revolutions without load 514

With Grammaire 50 4 pour

Ohms $D = \frac{66}{120} \cdot 2$ in 1.29

2° 35'

11 Ohms Total

8.6539
4.3269
1.4700
.8569
.0414
.8973

11. 78.9 Volts

50 | 66
1.32 .1206
4.36 .6595
comp 1.29 9.8894 .5289
0.6498 4.46

magnets not completed 57
15 = 9 1.28

2° 22'

on total 4.1 Ohms

8.6158
4.3079
2.4206
.8379 6.88 Webers
4.1 .6128
28.2 Volts 1.4507

50 | 15
.3

1.4771
.5289
.1006 .1 Webers

38 Magnet brought up

66 L 504 revo

4.46 0.6495
0.6495
1.6484
2.9474

886

32000 4.5185
2.9474
1.5711

37 for N.P
78.9 Volts

504 revo 37

85

Total 11.90

3° 57'

83 | 8.8381

4.4190 4.4190
2.4700 2.4700
.9490 .9290
11.90 1.0755 1.0750
1.0040
105 Volts 2.0275 101 Volts

50/83
166

.2201
.5289
.7490 5.61 Volts
.7490
1.6784
1400 3.1464
4.5185
3.1464
2.3.5 for N.P. 1.3721

40 June 17 1879

4 Daniells 50

105 on 1.29

1.25

5/105
2.1

2.1
4.36
Comps 1.23

.5496
.8718

4.3495
.8718
∴ 2.4777

June 17 1879 4

1.50 1.29

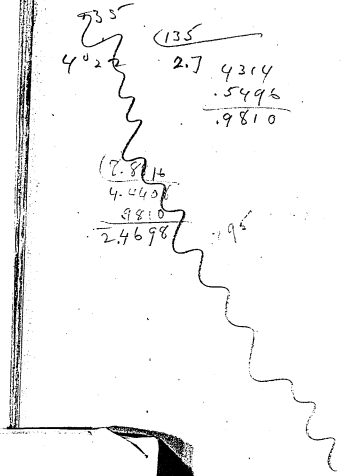
3 4771
5496
1.0267

5° 43'

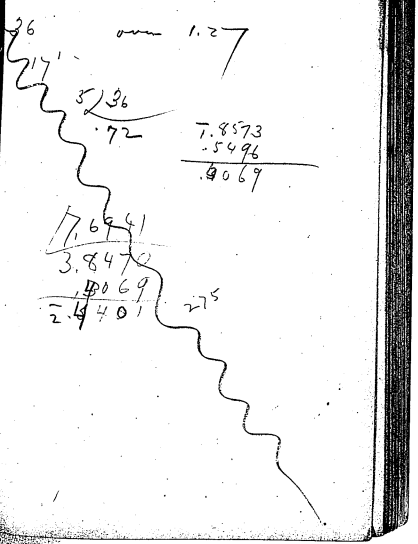
9.00 32
4.5 16
1.0 8
2.474

248

42 June 17



June 17 1879 43



4X

550 revs. running free

Gramme on field

267
534 revs

Field brought up 40 to left on field

on 1.28 — .18190 31
.5496
.45527
283 Watts

10 45'

Total

11.05 Amps

8.4848
4.2424 - 7
2.4725
11,05 a.7699
1.0434
1.81 33

65.1 Volts

Field not brought up 40

14 R

20'

.45527
.45527
45' .4484
9 .5542
2.5080 32

3.3 amps

4.5185
2.5080
2.0105

1.02 for H.P.

46

39 L

1° 42' 11.05 Ohms

8.4722
4.2361
2.4725
.7636 5.8 Webers
11.05 1.0433
1.8069 64.1 Volts

47

39 L 530 revs

2.75 Webers in circuit

20° 15' Total 8.85

8.55 9 | 8.5939
4.2969
2.4725
.8244 6.67
8.55 .9469
1.7713 89 Volts

2.75 .4393
.4393
1.6026
2.4812
4.5165
2.0373

109 per H.P.

rev. 538 with Gramme

520 circuit closed

530 running free

39 L 2.75 Webers on magnet

35° 12' Total 6.35 ?

35° 42' (8.8097
44048
-24725
.9323
6.35 .8028
1.7351

54.3 Volts ?

38-39 2.75 Webers on magnet

37° 4.75 Ohms

(9.0858
4.5429
-2.4725
1.0704 11.8

11.75 .6767
1.7471 55.8

50

532 Nevo

38 2.75 Wichsan magnet

8° 12 4.15 Ohms

2 | 9.15550
4.5775
3.4725
1.1050
4.15 .6180
1.7230

52.8 Volts

51

138
47
.91

4 Daniells . 52

59	1.7709
8.85	0.9469
6.67	.8240
65.1	1.8136
11.5	1.0607
	.7529

5.66

52

Book 8 p. 244

268 : 400 :: 64.1

64.1	1.80669
400	2.60211
Comp 268	7.57191
	1.98069

95.7 Volts if proportional to speed instead of 66

400 : 580 :: 85.6

1.25	.0969
85.6	1.9326
	2.02955

107 Volts if proportional to speed 86.4

53

500 : 731 :: 127

1H6	.1644
127	2.0899
	2.2543

179 if proportional in phase 169.

268 : 172 :: 64.1

64.1	1.80669
721	2.85719
Comp 268	7.57191 −10
	2.2357

172 in phase 169

54

340 : 530 :: 86.6

86.6	1.9375
530	2.7242
Comp 340	7.4685 − 10
	2.1303

135 Volts

268 : 1010 :: 64.1

	1.8069
	3.0043
amp 268	7.5719
	2.3831

241 Volts

in place of 210

268 : 340 :: 64.1

340	2.5315
	1.8069
	7.5719
	1.9103

81.2

55

1380	3.1399
64.1	1.8069
Comp 268	7.5719
	2.5187

330 Volts

in place 260 Volts

EMF

Speed	Observed	Calculated
268	64.1	
340	86.6	81.2
520	123.	
731	169	172
1010	210	241
1380	260	330

New machine on the field of the Grammer

Gramme 1086 ohms

H.O.R over 1.27

1° 50'

over 3.97 Ohms

1° 50'

8.5050 50/40

.8 1.9031

4.28 .6314

1.19 9.9208

.7800 286 .4553

.4553

.5933 1.6026

1.3730 2.5132

4.5185

2.00530

3.92

233 Volts

707 μ H.O

55° 1.27

2° 45'

on total 4,

8.6810

4.3405

2.4725

.8780

4 .6021

1.4801

30.2 Volts

1.1 .0414

.6314

9.9208

3.92 .5936

.5936

1.6026

2.7898

4.5185

1.7287 53.5

58

June 17

120 Over 1.27

4° 29' total 6.2

8.8930
4.4465
2.47225
.9740
6.2 .7924
1.7664
58.4 Volts

SV(120
2.4 .3802
4.36 .6395
temp 1.23 .9101
.9298
8.5 Webers

.9298
.9298
17 1.8451
44.5 1.6484
3.3531
4.5185
1.1654

14.6 per ~~24~~

3.12
2.40
.72

June 17

59

The standard cell make two new solution one with the stopper evaporated the other with some pure acid in it.

---

determine the polarization of the Gramme on the speed it is running 5 measurements

---

running upon field

Run field from Edison
15 Webers
8 Webers
3 Webers

Try polarization

Measure resistance

On the Edison I will 61
make the following tests

Put ~~two~~ 2, 3, 4, 5, 6, 7, 8, 9, 10 Webers on the field and run down the pulley.

62 June 18

No. 1 200 R

No 2 191 L

No. 3 200 R

Old Standard 198 L

200 R

No 3 192 L

New Standard 2x slightly warm

200 L

200 R

199 R

197 L

Wheeler 192 L

192 R

New 200 R June 18-63

Old 192 R

No. 3 all 190 L

No 2 186 R

No 1 192 L

New 199 L

67 Gramme on its own field.

Wells 50 L

1080 revs.

90 over .95

3°58' Total 7.6

50/90

Daniell 1.07	1.8	.2553
	4.28	.6314
Comp	.91	10.0410 - 10
		.9277
		.8808 8.46 Webers
		1.8085

64.3 Volts

3°58' 9.8399

4.4199

5.4200

.7474

4.4199 - 5

.19247

2.4922

Gramme on its own field 63

1080 revs.

152 over .95

10°37 Total 5.55 Ohms

50/152

3.04	.4829	
4.28	.6314	
.91	.0410	
	1.1553	14.3 Webers
5.55	.7404	
	1.8957	

78.6 Volts

9.2653

4.6326

7.1553

2.4773

.540

1080 revs

.075

1,100 running free

66 490 Grammme
980 revo on his own field

235 Run 1 Ohm
220 Total 3 Ohm

1.1980
.0177
1.2157

220 235
4.7 .6721
3.28 .5159
Comm Meters 1.1980
3 .47.71
1.6751
47.3 Volts .0502
1.7253 53.1 Volts
Comp .96 .0177
1.7430 55.3 Volts
55.3 corrected for fall in speed

95735
41867 41867
1.21557
2.5719 231

Brushes on commutation for best output

1090 revo June 18 67
magnet not brought up
33 R Rvor 1.27

20 / 12.4 Total

55/33
.6.6 7.1175
3.28 .5159
comp 1.23 9.2101
0.2455
12.4 1.0934
1.3559 21.8 Volts

20 / 7.7647
3.8823
2.4555
2.6368

68

1090 revs.

123 ohms 1.28

Total 7.85 ohms

40°

50 / 123

2.46 .3909

2 28 .6314

Comp 1.24 .9066

.53 AB

9.9289

7.85 .8949

1.8238

66.6 Volts

40°

8.8435

4.4217

.9289

.4828

69

June 78

Field not brought up

60 R 1890 revs

47'

Field brought up 9.47 ohms total

72 R

1° 27'

~~not brought up~~

Field opened and down to

52 standard from 43 and

run gradually 3 minutes

41' / 50 / 72

1.44

.1584

.5340

.6954

9.47 .9731

1.6675

46.7 Volts

1.5
1.0 !
.49 in armature

10 r
3 v
.71 shunt magnet

1107 revs

72 Edison on field of Grammer

50 (5-7)
1.14
1.14 lamp 1.26
.0559
.6314
.8996
.5879
3.88 Webers

Grammer field

20 41'

Total 3.94

8.6703
4.3351
2.4750
.3431
.5385
1.4356

3.94
3.88
.0579
.0579
.71 1.2513
40.8 1.4997
27.2 lbs
8.71
2.7754

33 ohms 4.5185
2.7754
1.7431

1.5356
.9701
1.6484
4.1241

85 per H.P.

13300

field brought up June 18 73

10
1.4
.5310
.1461
.6771 4.45 Webers

4° 40' 3.94 Ohms Total

8.9104
4.4552
2.4950
.9602
.5977
1.5579 36.1 Volts

714

.6771
.6771
1.4997
2.8539

4.5765
2.8539
1.6546

46.2 per H.P.

Took out resistance until Edison on 5 min

1/59 = 1.118

3° 25'

8.7752
4.3876
2.4450
.8926
4 .6021
31.2 Volts 1.4947

.5310
.0719
.6029 .401 N

4, [illegible] total Ohms

.6029
.6029
1.4997
2.7055

4.5185
2.7055
1813.0

65% H.P.

Not brought up to full

120

8.22 : 4.1 Ohms Total

9.1628
4.5814
2.4450
1.0864
4.1 .1628
1.6992

50 Volts

120
24 .3802
.5310
815 .9112

.9112
.9112
1.4997
3.3221

4.5155
3.3221
1.1934

15.6 H.P.

76

Examples

125
2.5

9° 27'
fall to
9° 12'

9.2028
4.2019
5.1250
1.1964

4.1 .6 24
1.7172

52.4 Volts

7.5 .3979
.5310
.9289

8.45 Webers

Total 4.1

1.7192
225
1.7417

553

77

Field and brought up

30
.6

30 - 29 = 1 on 1.26.6782, 7782
1° 10' see p 72 .5310
2.04 Webers .3092

Total 3.94 Ohms

50/36 .8 1° 10'

8.3087
4.1543
2.4950
4.056 Webers .6593
3.94 .5955
18 Volts 1.2548

.3092
.3092
.71 T.8513
44.5 1.6484
2.1181 131

T.8513
1.6484
1.4997

38.000 4.5185
2.1181
2.4004 250 per H.P.

No change as field brought up
30.
10 10 ½ Total 26.8

26.8 .3092
1.42781
1.7373

Field brought up

Gramme 1100 revs
30
1° 15' Total 3.91

8.3377
4.1688
2.4950
.6738
3.91 .5922
1.2660

1848 Lines

74 on field brought up

1° 15' 1.48 revs.

10.1 Ohms

74
1.48

.1703
.5310
.7013
5.03 Webers .7013
1.4997
2.9023

4.5185
2.9023
1.6162.

41.3 per H.P.

1° 15'
8.3387
4.1693
2.4950
.6743.
10.1 1.0043
1.6786

47.7 Volts

80

74

1° 30' Total 8.21 Ohms

8.5050
4.2525
2.4950
.7575 5.72 Webers
8.21 .9143
1.6718 47. Volts

81

1113 revs. 1/41.3 magnets per H.P

74 on field

Gramm 6.15

2° 46'

8.6836
4.3418
2.4950
.8468
6.15 .7889
1.6357 43.2 Volts

82

4° 29' 3.99 Ohms

4° 29' (8.8932
4.4465
2.4950
.9515 8.94 Webers

3.99 .6010
1.5525

35.6 Volts

83

1050 revs

74

5° 45' over 3.55 Ohms

(9.0008
4.5004
2.4950
.9954 9.89 Webers

3.55 .5502
1.5456 35.1 Volts

84.

1055 rpm

6° 38' Ø1.05

1.90626
4.53133
2.4950
1.03633 10.8 Webers
3.05
0.48433
1.52066 33.1 Volts

1050 rpm

85

8° 35' 2.5 Ohms

1.91739
4.58699
2.4950
1.08189 12.1 Webers
2.5
0.39794
1.47984 30.2 Volts

86

1055 rev.

11° 28 2.0 1 Ohms

4 Annulls 49 L

9.2984
4.6492
2.4950
1.1542 14.2 Webers
2.01
.3032
1.1574 22.8 Volts

87

Constant of shoulder

53 | 50 53
45 | 1.06 .0253
4.28 .6314
1.24 .9086
1.8633 .6380

comp.

2 (8.1169
4.0584
1.5633
2495

8.0

5 | 40
1.6 .2041
.5380
.7421

1° 43'

8.4765
4.2382
.7421
24961

88

109 | 109 | 2.18 | .3385 | .5350 | .8765

30° 4'

8.7283
4.3641
.8765
2.4876

140

49° 50' on 1.3 Ohms

1.25

140 | 50 | 140 | 2.8 | 4.28 | 1.25 | .4472 | .6314 | 9.9031 10 | .9817

8.9256
4.4628
.9817
2.4811

89

180 on 1.62 Ohms

180 | 3.6 | .5563 | 4.28 | .6314 | 1.58 | 9.8013 -10 | 0.9890

50° 20'

8.9682
4.4841
.9890
2.4951

142 . 1.3 Ohms

5° 18' 50 | 142 | 2.86 | .4564 | 4.28 | .6314 | 1.26 | 9.8998 -10 | .9874

8.9545
4.4772
.6314
.5400

4.4772
.9874
2.4898

140 on 1.3

5°

140	
2.8	.4472
4.28	.6314
1.26	.8996
	.9782

8.9423
4.4701
.9782
.4919

240. on 2.14

4° 59

240	
4.8	.6812
4.28	.6314
2.10	.6778
	.9904

4.4701
.9904
.4795

124 1.13

5° 81

124	
2.48	.3945
4.28	.6314
1.1	.9586
	.9845

8.9517
4.4758
.9845
.4913

64 .63

4° 57'

64	
1.28	.1072
4.28	.6314
comp .59	.2291
	.9677

8.9359
4.4679
.9677
.5002

92

30 cm 2.83 cm

55.6

2° 16' on magnet

53	$\bar{2}.4951$
80	4961
109	4876
140	4811
160	4951
173	4954
140	4919
240	4795
124	4913
84	5002

say 4950

$\bar{2}.4950$ constant

No 1 109
No 2 111 R
No 3 109 L
Standard 109 R
10% L

Wills 44

.6314
9.5157
1.5328
1.6799

beginning

amp 44 8.3565 − 10
lag 4.28 .6314
Coup 3.05 9.5157 − 10
2.5036
18 1.2553
7589 .57 Webers
54.1 1.7322
1.4911

31. Volts

2.5036
34.1 1.5328
.0364
29 1.4624
31.5 Volts 1.4988

191 382 216
352 221 432
442

Edison vs Gramme

7° 2'

Gramme 435 revs.
18 K 54.3 Ohms Total
over 3.0 Ohms

32 vs 3.0 Ohms Total
3
29 34.1 Ohms 3 Resistant

7° 2'
9.0879
4.5439
2.4950
1.0489 11. Webers
1.0489 4.5185
.71 1.8313 3.5975
44.5 1.6484 .9210
3.5975 6.3 per H.P.

585 revs

293 / 586 revs

36 on 3.05

34.1 Total

.0364
36 1.5563
1.8927 39.1 Volts

time 2.50

897 revs.

56 on 3.05
34.1 ohms total

.0364
56 1.7482
1.7846 60.9 Volts

98

Dmc 26

1324 rcvd

87

81 .0364
.9085
1949

88.1 Volts

88.1
4
3.524

88.1
3.5
846

99

6° 41'

1724 rcvd 5

6° 57'

40 / 110
2.75

amp 3.15

428 .6314
9.5-1.57 = 10
1.53 28

2.75 .4393

20 131 Volts 2.1192

4 wks 40 L

11.1 | 44.5 | .71 | T. 8573
1.6484
1.4997
1840 rmp. | 11.1 | 1.0485 3
1.0485 3
75.9 Volts | 3.5903
4.5185
8.47 per H.P | .9282

1.4997
13.6 | 1.1335
1.1335
83.1 | 3.7667
4.5185
5.65 per H.P | .7518

28.849
14.174

23 | 1.4997
1.3617
1.3617
4.2231
4.5185
.2954 | 1.9 per H.P

Examine C C

8.26 | .9170
5.16 | .9170
1.8340
2.8979
1.0639
1154

44.3 | 1.2554
.8 | .7552
1.5006
84.5185
2.8979

102

What is needed

H.P. Dynamometer

540 shunt circuit on field

680

140 lbs Edison shunt circuit

240 revs.

.54

2 feet

3.14

6.28 .7980

188. .2742

3.0722

1183 feet a minute

103

1183

60

70,640

940 Watts on scale

20 ohms entered shunt

840

755

8.5

1183

2366

4732

2366

49686 watts

104

840 2 Mins outside
675
145.

345 revolutions

1183
117.5
5915
2366
23660
2.3701

414 revs. 2 Mins outside

840 1183 3.0731
675 117.5 2.0700
235 2.1432

139,000 ft. lbs.

105

414 revs. 20 mins outside

840 11.83 3.0731
612 11.4 2.0569
228 5.1240

134,700 ft. lbs

451 revs.

840 1183 3.0731
626 15.7 2.1959
214 5.2690
185.5 4.5215
7505

4.44 H.P.

5.6 H.P.

32 32
44
32
132
1408

6 Ohms outside

[illegible]

200		
60	11'53	2.0731
155	77.5	1.8893
		4.9624

91.700

Surface

255	7.5935
	7.5935
Comp 345	2.5378
	2.5378
49.68	9.6962
	4.9588

90.900 ft lbs if on a square of shaft.

255 — 345

100	2.
10-0	2.
comp 8	9.0309
	3.1769
24.5	1.6486
	4.7453

56.600

11.5	2.0607
11.5	2.0607
	9.0986 – 10
	3.2193
	1.6486
	4.8667

73.500 lbs

13 ft 4 in

10 ft

8 ft

164

1.2104

1.1774

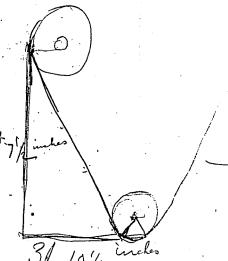
100

16

116

.0645

1.0322



13 ft 4 in
6 floor

13 ft 4
2 8½
10 ft 7½

127.5 inches
46.5 inches

Around the pulley
6 ft 2½ inches

Another measurement 6 feet 3⅛ inches 114

127.5
46.5

see page

2.5 / 12 = .208

6.208 around pulley

110 847 lbs Wt of box

124 / 2 / 248 — 4 lbs 13¾ oz revs a minute

820 lbs Pump on

840 Pump off

24 inches — 13.25 /// — 16 — 1.1222 — 1.2041 — 1.9181

248 revs. .828

24. 1.3802
3.14 .4969
Diameter 2. .3010
248. 2.3945

4.5726

inches 3.7360 — 4.5726 — 1.0792 — 3.4934

3.114 feet — .1837 — 4.0771

4.828

11.900

1183 20
2 | 23660 ft. lbs.
11830

3.14
4
12.56 1.0987
248. 2.3945
3.4932

3112 ft

11830 Edison
11900 Prony

6.75 lbs.
4.82
11.57

1.0634
3.4932
4.5566

36000

847
785
lbs 62

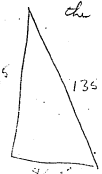
1183
62
2366
7098
73346

Edison 36.673
Prony 36000
The Prony placed on the shaft of the lower cone pulley.

114

The amount to be added since the belt is not taken the weights directly.

∴ page 109



127.5 × 2110 57

11130 | 4.2075

1.6275

2163 | 3.3350

18293 | 4.2621

2.1310

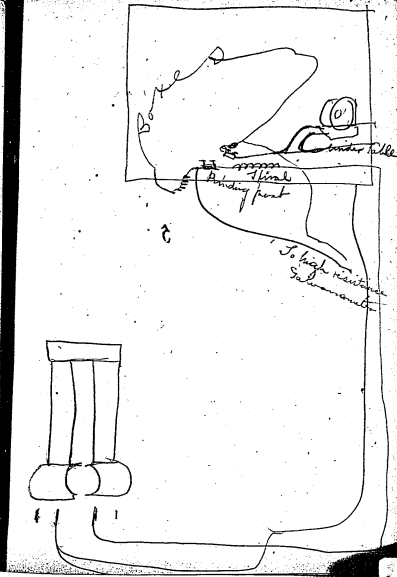
136.8 × 2.1038

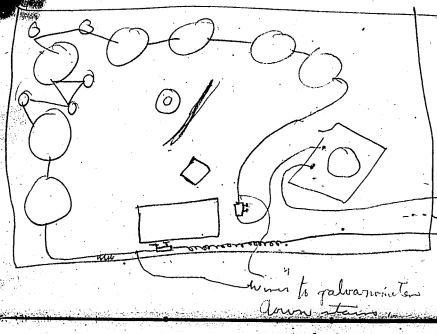
127.5

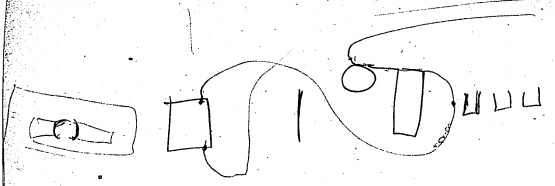
.0272

1.065 correction to be added that is result must be multiplied by this number to express true H.P.

115




under table
Lines to
Dynamo
Machine



740
1100
74
77
814,000
33) 407,000 (12.3
33
77
66
110

12 1/3 H.P.

Total amount which the dynamometer can transmit.

1150 3.0607
137 21367
5.1974

2657000
33) 77,580 (2.3
66
115
99
160

July 14th

Speed of shaft

184 per minute

74.5 1.8722
3.14 0.4969
1.37.3

23.7

2 | 74.5 inches around pulley
6.208 feet

2π 6.208 0.7929
184 2.2648
3.5577

1143 feet per minute
Speed of belts

Dynamometer

844 lbs running free on cords

837 with Edison running free

7 lbs due to Edison

655 net

1143
7
2 | 8001
4006
8001 ft lbs

33000 (4.1 H.P
2
8.2 H.P
10
82 of H.P

9 cells on magnet
830
14
8000 ft. lbs.

July 1st

Edison ~~[illegible]~~ revo

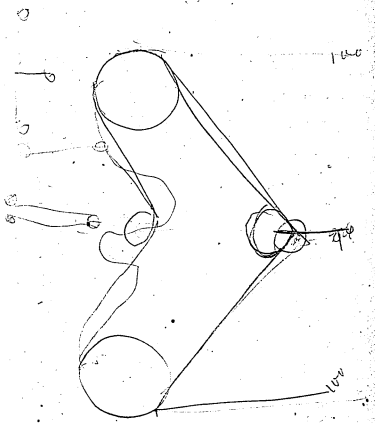
537
540

844
837
7

3½ in Wht

1143
35
5715

July 1st



124 July 1st

838 with commutator
1 1/2 magnetism

533
541

7

1143
1.5
5715
1143.
17145

1143
3.5
5715
3429
40005
.20000.

1143
2.5
5715
2858
2)28575
14287.5

July 1st 125

841 lbs belt off

841 lbs
836
5 lbs.
2 1/2

machine running free
Commutator on

2857.54 lbs
172450
28575
3029.950
3029 ft. lbs.

841 lbs
837.5
3.5

Commutators off

2000. ft lbs
106
12000
2120 ft. lbs.

The Shunt field current remains when running magnets open circuited open but commutator untouched brushes on.

33.000	4.5185	3029 ft. lbs
3029	3.4812	
	1.0373	

10.9 per H. P.

Under the same conditions but having the commutator brushes off it consumes

2120 ft lbs

33.000	4.5185
2.120	3.3263
	1.1922

15.5 per H. P.

The brushes require 909 ft. lbs.

3029	4.5185
2120	2.9586
909	1.5596

36.3 per H. P.

July 1 1879 127

Constants

E. M. F. of Daniells 1.08

Cu. Saturated solution Cu. Sulphate
Saturated solution Zn. Sulphate, amalgamated Zn.

I take the equivalent of one Weber over one Ohm as 44.3 foot lbs. These are the results of Rich Association

The half of the weight obtained on the scales must be multiplied by 1.06 to obtain the true strain in the belt.

Run 335 revs. July 1st

831 lbs. magnet with circuit closed

6.05 Webers in it

01 Deviation 52° 30' through magnet

75° 3 lbs. Circuit closed

Electro Dyn 6°

Total 8.1 Ohms

Estimate

$c^0 \overline{)19.192}$

4.5096 -5

2.4950

1.0146 10.3

831

753

78

3.9

July 1st

1143 3.0581

39 1.5911

4.6492

44.500 ft. lbs.

Estimate Current

10.3 1.0146

10.3 1.0146

comp 8.1 .9085

log 44.3 1.6474

4.5851

38.400 ft. lbs.

4.5851

4.6492

93.59

86 % Estimate

July 1st

5.5 .7444
5.5 .7444
19 7.9542
44.2 1.6464 — 1.6006
3.0894

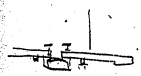
12 28
33.2 — 4.5155
3.0894
1.4291

26 magnets for H.O.

tan 45°

1.
9.3332
.1668

4.64 Webers at 45°



July 1st

To determine the constant of Tan. Galvo.

Two cells of Condit and Hanscom passed through Tan. Gal. and by shunt put through high resistance on which 5 cells of Daniells give 50 deflection

22° on Tan
30 on high res
over 1.88

3. .4771
1.88 .2742
10 9 .2032
.2403

1.59 Webers
for 22° deflection

9.5735
.2403
9.3332

12° 9' for 1 Weber

132 July 1st

52° 30'

0.1150
9.3332 -10
.7818

6.05 Webers

.7818
.7818
1.6006
3.1642
4,5185
1.3543

22.5 Magnets per H.P.

	9.3332	1 Webers	9.3332
	.3010		.6990 5 Webers
23° 17'	9.6342	2 Webers 47°9	10.0322
	.1761		9.3332 6 Webers
32° 52'	9.8103	3 Webers 65°	.7782
	9.6342	52°15	10.1114
	.3060		9.3332 8 Webers
40° 44'	9.9352	4 Webers	.9031
		59°5'	10.2363

50° Edison 5.3 Webers July 1st 1.33

5.53 Webers on field

.0761
9.3332 -10
.7429

758 lbs

178 = 5 17.8 Daniells

on 1.91 6° 10'

Total 8 Ohms

	17.8	1,2504
	1.08	.0334
Comp.	1.91.	.7190 −10
		1.0028 100.5 Webers

80.4 Volts

134

July 1st

535 rev.

Clearwater

10.05 — 1.00 28
10.05 — 1.00 28
8 — .90 31
14.3 — 1.6464
3.5551

Power 35.900 ft. lbs.

831 — 1143 — 3.05772
756 — 36.5 — 1.5623
73 — 1.06 — 0.02553
36.5 — 4.64448
44.100 ft. lbs. — 4.55351
.0897
.9103
= 81.4 %

490 revs.

July 1st

135

690 lbs running on its own field

840 running free

690
150 lbs 490 revs.

68.7 lbs run

284 = D

10° 27'

153 lbs.

136

July 1st

940 revs

25° 30'

940 revs

366 lbs

9.7 Ohms Total

840
366
474 lbs
237

237 2.3747
1143 3.0572
1.06 .0253
3.4572

286,000 ft lbs
330 880
4.5185
.9387

8.68 H.P

137

July 1st

6° 10'

9.0310
4.5155
1.0028
2.5127

page 133
Constant

2|9.6785
4.8392
2.5127
1.3265

21.2 Webers

1.3265
1.3265
9.7 .9826
49.3 1.6467
5.2820
4,5185 191.000 ft lbs
.7635

5.6 H.P.
6.4 H.P.

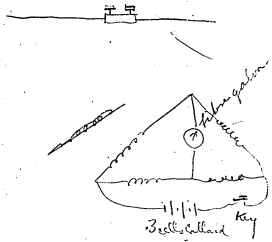
138. July 1st

4/64

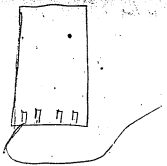
1.6

3

4.8 outside H.P



139



170 490 news. July 1 Rage 13.5

2 1153
765

1.8837
3.0825
4.7002
4.5155
92.500 .4577

2.26 N.P.

1143 feet on Lilt
80.6
1.06
4.9883

840 525 news July A1

679
161
80.5

1.9058
3.0825
4.9883
4.5-1.83
.4698
97.300
2.95 N.P

245 L
on 1.95 Ohms

11° 20
10° 40

9.1 Ohms Total

24.5 1.3892
1.08 .0334
1.95 9.7100 -10
1.1226 13.2 Water
1.1226
44.3 1.6464
9.1 .9590
4.8506
70.900 4.5-1.85
.3321

2.15

142

July 1st

525 revs

1143

80.5

1.08

31 0572

11 9058

1025

4.9883

1143

80.5

5715

9144

92.0115

1143

80

91440

571

92.011

143

July 1st

832 lb machine running

660

150 401

8,1 Total

290

over 1.87

832

660

172

86

148 2.2742

96. 6.208 0.7929

3.0671

1166. 3.0671

86 1.9345

1,06 0.0253

5.0269

106500

3

109500

29. 1.4824
1.08 .6334
comp. 1.87 91.7282
1.2240
16.75 8.1 .9085
2.1325
135 Volts 1.2240
44.3 1.6464
5.0029

100,000

5,0029
5,0269
.9760

700,000
87.5

8|94.70%
11 83
82.87% outside of question

9.4314
4.7157
2.5127
7.2030
1.2030
.9085
1.6464
4.9609

91.000
4.9609
5.0269
.9340

85.9% of constant of Dynamometer
10 74 to 2.5.127
75.16% outside of machine

5.0029
5.0394
.1635

92%.. If the reading on galvanometer was correct 92% of the power given to the belt driving the Edison was turned into electricity

89% if correction made for Tan 2α

65|230 (3
195
350

68)204 (3
204
260
264
560

July 1st results 147

In the morning made a concentrated solution Sulphate of Zn. found by experiment that acid must be added in small quantities to dilute solutions.

Arranged high resistance galvanometer so that five cells of standard Daniells, p. 127, could be thrown on the line by a switch made the deflection 50 or 10 for each cell, 5 cells in line.

Measured the distance of scale to galvanometer 680 mm length of scale = 65 mm

Tan 2α = 28/680 = .33 = 18° 40'.

720 scale divisions equal 460 mm
360 on a side

33 | 87.500 | 26
.56
215
198
7

2.6
6
15.6

Therefore there will be corrections to be made for the scale divisions on the galvanometer

156.1
2
312.2

4.3
2
8.3 correction

~~300 scale 292~~

360 scale divisions to 338 = tan 2α

at 338 correction 4.6 / 2 = 9.2

$\frac{324}{360} = \frac{169}{180} = \frac{56.3}{60} = \frac{338.1}{360}$

300
280

Tan galva with summer

For 360	dead	352	− 8
" 300	read	295	− 5
" 250		247	− 3

revs.	speed of belt	log
180	1117	3.0482 180
181	1126	3.0506 181
182	1131	3.0530 182
183	1137	3.0554 183
p.120 184	1143	3.0577 184
185	1148	3.0601 185
186	1154	3.0624 186
187	1160	3.0647 187
188	1166	3.0671 188
189	1173	3.0694 189
190	1179	3.0717 190

6.208

180 0.7929 × 2.2553 = 3.0482

181 0.7929 × 2.2577 = 3.0506

182 0.7929 × 2.2601 = 3.0530

1832 0.7929 × 2.2625 = 3.0554

183 0.7929 × 2.2648 = 3.0577

184 0.7929 × 2.2672 = 3.0601

185 0.7929 × 2.2695 = 3.0624

186 0.7929 × 2.2718 = 3.0647

1864 = 4

3.0671 + 23

3.0694 + 23

3.0717

Results July 1st

Revs. shaft 184 ten minutes
185
188

6.05 Webers on magnet

22.5 magnets for H.P.

Speed 535 revs Page 126

44,500 ft. lbs consumed

on total 8.1 ohms

The constant of the Inglis P.131

9.3332

535 revs Page 133

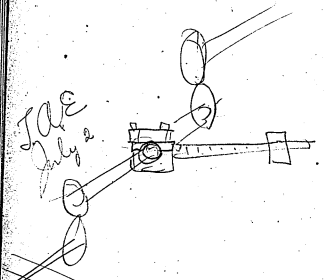
5.53 Webers on field

44,100 ft lbs given to machine besides the power required to drive the armature

35,900 in current 81.9%

80.4 Volts on 8 Ohms

940 revs 9.7 Total rev field
286 000 ft. lbs energy
8.68 H.P.



Two carbon lights
814.5 lbs ? running armature
727. circuit open
circuit closed 178

356 revs

185

1148

814.5
727
1875
43.75

1148
43.75
8036
3444
4592
50,167.6

33) 50,167 (1.5 H.P. ?
33
171
165
60

9375

2.3 H.P. about

154

.0761
9,3332 ⅛ 50° on Cir.
.7429
.7429
.91,9542
1.6464
3.0864

1,220 ft lbs on magnet

15 30 Volts
6

4.5185
3.0864
1.4321

26,4 Magnets for H.P.

Speed aloft. July 3. 1918

" machine open 525
" " closed 475

Wt ball off 92 oz
" ball on magnet open 9.14 lbs
" " " magnet closed
" " " circuit closed 955

Deflection High resistance 2.65
" Ohms 1.85 after 4 min
" Dynamometer 120°35' July 1917

Total resistance 8.1 after two min

Deflection Tan. Galva on magnet
Results H.P. consumed magnets
machine

H.P delivered
% delivered to consumed including friction
% existing friction
Volts

2.3472
1.9165
4.1647

82.8.

920
755
165
825

92.200 H.P. Consumed

.4476

2.79 H.P.

4.1647
1.065 .0274
4.1921 98.200 from the
4.5185 "
4736

2.97 H.P.

6 lbs
3 lbs due to armature 3.0482
.0274
.4771
3570 ft lbs 3.5527

26.5 1.4232
1.08 .0334
amps 1.87 9.7282 - 11
1.1848

15.2 Webers .9085
8.1 Cms
2.0933
124 Volts 1.1848
44.2 1.6464
4.7245
84.000 4.9921
.9324 85.6%

158

Wt 800 after coils heated.

Deflection high resistance 210

Deflection 10° 30'

Deflection ten on magnet 57

159

Speed shaft 178

" machine circuit open

" " circuit closed 490

Wt Belt off

Belt on circuit open 915

Belt on 4 magnets shunt 905

" " 4 circuit closed 785

787

Deflection High R 215

on Shunt = 1.52

Deflection Dynamometer 12° 6'

Total resistance 6.84

Deflection Tans. galvanometer magnet 62°-5'-30"

57° 0,1874

9.3332

.8542

.8542

1.9562

1.6468

3.3030

4.5185

2630. 1.20195

16 magnets for 4/0

160

21.2 1.3243
1.05 .0334
Comp 1.52 9.8182
1.1751

15 Webers
15. 1.1761
6.84 .8351
102 Volts 1.0112

1.1759
1.1759
.8351
1.6464
4.8333
68.100 ft. lbs.

178
6.208
65

2.2504
0.7930
1.8129
4.8563

915
785
130
65

71,800 ft lbs
4.5185
.3388
2,184 H.P

4.8336
4.8563
.9770
94.8%

74,800 4.8333
4.5739
.9594
91% as against pulley

178
6.208
60
66,200 ft. lbs.

2.2504
0.7930
1.7782
4.8216
4.8333
102

102%

162

163

Spark shaft
" machine circuit open
" " closed

Test of fall in resistance
130 39'
machine circuit closed

1		4	
20		20	
40	5.60	40	
		5	5.52
2		20	
		40	5.50
20	5.55	6	
40	5.55		
3	5.52		
20	5.52		
40	5.52		

1

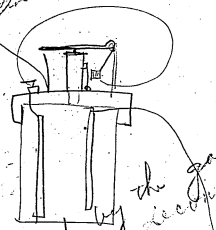
20 5.75
40 5.68
2
20 5.65
40 5.62
5.60
3 20 5.60
20
40 5.70 ?
!
3 5.52
20
40 5.52
4
20 5.51
40
5
20
40

0 5.90
20 5.75
40 5.65
1 5.62
20 5.60
40 5.59
2 5.57
20 5.55
40 5.54
3 5.54
20 5.53
40 5.53
4 5.52
20
40
5
20
40

5.90
5.57
.23
5.57

1.3617
2.7459
1.6158

4.10 ~~40~~ 40 to be added to the two readings



Regulation to act by the gases given off from the electric light-
given off from the cell.

at 550. ohms 100,000 foot lbs per min
Electricity given off
on 8 ohms

~~Horse power at 750~~

$550^2 : 750^2 :: 100000 : x$

2.8751
2.8751
comp 550 7.2596 - 10
7.2596 - 10
4.
4.2694

8 | 186,000 ft lbs
23,250
33 | 1627.50 | 49
132
307
297

4.9
6
29.4 lamps
at 8 ohms per H.P.

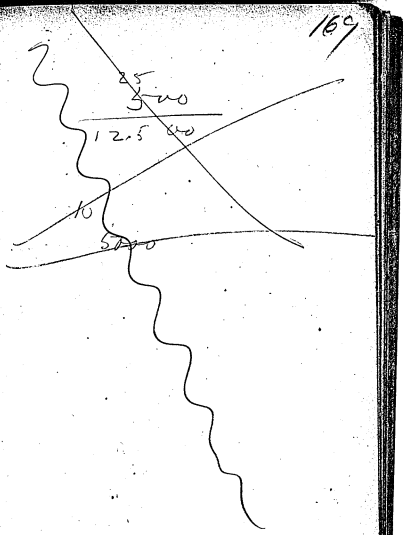
168 July 3

915
720
195
97.5

2 Carbon light

6.2 .7924
180 2.2553
97.5 1.9890
5.0367

108,000



169

170 Page 165 July 3

The resistance of the wire does not make as great a difference, since on the high resistance, Galvo, the resistance of the shunt increases proportionately to the resistance of the main circuit. But in measurements with the dynamometer this factor plays an important part, in that with the E. dynamometer as it is in that case the Webers are directly measured.

As the shunt, when removed cold has on a diminished resistance, the E. M. F. deduced from the high resistance, is greater than reality so that the constant on the dynamometer is smaller

July 3. 171

The constant of the dynamometer should be determined for low current and this would be found from testing

30 15
19
2.4

30/2.4 = 30 (12.5
24
60
48
120
120
0

1.0969
1.0969
1.0969
1.6464
3.7944
4.5185
.7241

6222

F. 23 per 1. R.

905 J

13010
.0752

118

13010
1505

Speed shaft 80
Stud machines 310

Wt when magnet and circuit open 905
Wt magnet closed 893
Wt " circuit closed 745
A. plating high resistance 135 .140
" low "
A. Electrum Dynamometer 6° 30'

Tan 5° 7'-8 50°

Total 6.8

Shaft 183 revs

Machine 342 revs

$\frac{171}{342}$

177

Without belt	924
With belt	922 1/2
Magnet	
On —	909
	913
Circuit closed	861

Deflection 144 = 0 on 149

Tan 62°

Total 6.85 6

178

924
881
63
31.5
106

3.05 54
1.4983
4.55 37
.0253
4,57 90 ft. lbs. consumed

35.8 ft. lbs.

Armature 14.4 1.1584
corrector for Volts 1.08 .0334
Coil Ohms 1.49 9.8268
1.0186 Webers

Ohms 6.85 .8357
.71.5 Volts 1.8543 Volts
1.0186 Webers
44.3 1.6464 equiv.
4.5193 ft lbs delivered
4.5587 " " consumed
.9656

92% as against magnetic off

179

913
861
52
26

3,05 54
1,41 50
4.47 04
.0253
4.4957
4,5193
4,47 04
01.04 91

1.12% as against magnet closed

4,51 93
4,57 90
.9403

87%

6 4,47 04
.0253
4.4957

180

Tests with Prony 181

Prony 1.281 lbs
3.333 ft. lbs

4.5 oz
16) 45 (281
32
130
128
20

20 inches
12) 40 (3.333
36
40

1.281 .1076
3.333 .5228
3.141 .4971 1.0199
229. 2.3598
3.4873
1076
3.3797

3070 ft. lbs

182

Edison 158 rpm

1.1665	3.0641	3.0815
2.5	.0278	
	.3979	
	3.4894	

3084 ft. lbs

3070

+ 18

183

2.9 — 3.3797

2.9 — .1624

3.8421

Prony

6951 ft lbs

1.1375 — 3.0815

6.625 — .8212

3.9027

Edison

7990 ft lbs

lbs — 3.0815 — .8451 — 3.9266

8440

184

Prony at 236 mm

236 .4624
.5228
.4971
2.3729
3.8552

716 2 36 for 238
8

185

33
33
16½

29 3.0915
#65 6.25 .7959
82.5 3.8874 ?
6.25

Edison 7540 3.8874
716 2 .7711
3.78

188

186

Edison

931.5
894.5
18260
913
912.25
1825 25
912.62

895 1/2
929
1824.5
912.25

929
912.62
1638
8.19

3.0415
.9133
3.19948
4.0048

101.000

187

Jenny

240
4,063

2.3802
.6088
1,0199 4.181
4.0089

6 | 1.00
.062
7.7949

10.200
9880
Int −3.20

58
929 Fictional

Ehrem.

853
900
1753
876.5

929
876.5
52.5

52.5
3.0815
1.7202
4,8017

2 | 6 3,9 0 0
3 | 1,6 5 0

6 4 8 0 0
324 avg
ft lbs ft lbs

To find out how many ft lbs
36650 4.5641 a weight
25.2 used
3.4213
1.1428

25.2 2.4014
1.0199 plus
3.4213

13.9 lbs should weigh

6 | 12 1/2
3 | 7 2/17
4 | 13 3/4
14.10 1/2 instead of 13.9

190

191

252

16 | 10.5 1.0212
16. 1.2041
.8171
.656

14.66 1.1662
252 2,4014
1,0199
4,5875

38.600 ft lbs

192

900
853
1783
8765

929
8765
2 5252
26.25

193

Edison

.188
.2625
1.065

3.0641
1.4191
.1027 4
.0915
4.5106

32.400

Penny

2.0
2
12) 40) 3.333

14.66 · 1.1662
3.333 · .5228
3.142 · .4972
252. 2.4014
4.5876

10.5
15) 105 (6.56
96
90
80
100
96
4

38,700

Penny

194

195

2 | 59
29.5

3.0641
.0274
1.4498
4.5613
36.400

95½
45
1435
11.7

129
71.7
2 | 5.88
29.15

3.0641
.0274
1.4636
4.5551
35.900

20
21
18.2
22
205
1017
203

529
203
87

4.4 lbs.

900
840
1740
870

889
954
1843
921.5

882.5
954
1836.5
918.2

888
956
1844
922

890
891
1841
920.5

3.0641
.0274
4.4

3.0641
.0274
.6435
3.7350

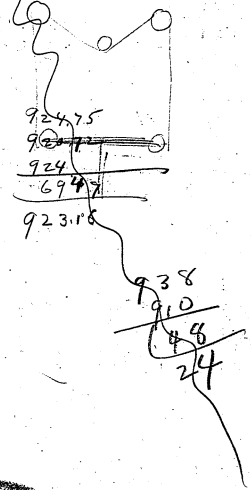
5430 ft. lbs. required to run the Edison

speed?

942.5
895
18405
920.2

945
904.5
495
9 24.75

200



929 Commutation off 201

924.75
2 | 4.25
2.125

3.0641
.0274
.3273
3.4188
3.0915

2620 ft lbs

Again Commutation off the Edison Spool 3.

3.0915
2.92
.4654
3.5569

898.5
943
184.1.5
920.72

Sum extremes of balancing

3600 Mean of 3

929
923.16
2 | 5.84
2.92

3.0915
2.5
.3979
3.4894

3080 ft lbs

924

202

948
891
1839
9195

8'92.5
941.5
18340
917.

929
917
12
6.

Edison commutation off 3

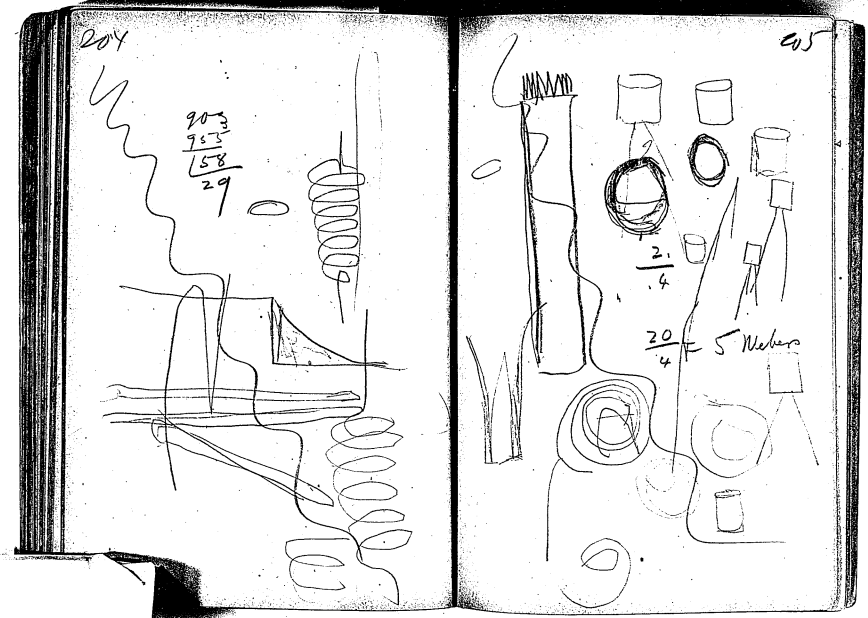
929
919.5
95
4.75

3.0915
.6767
3.7682

5860

3.0915
.7782
3.8697

7409.


204
205
2 0 3
9 5
5 8
2 9
2.
.4
20
.4
5 Meters

206

937.5
918
1855.5
√927.75

938 1/2
909 1/2
1848
√924

944.5
910
1854.5
√927.25

946.5
910
1856.5
√928.25

943.5
912.
555
√927.7

943
913
56
√928

940.5
911
515
√925.75

940
915
55
√9275

888
960
1848
922.5

943.5
913.
1856.5
√928.25

938.5
920.
585
92925

July 7 1879 207

average left off

92.4.
927.25
928.25
927.75
928.
925.75
927.5
928.25
927.75

929.25
927375

185 shaft of b shaft.
184 taken as mean

936.5 | 935 | 935 | 934
904. | 909 | 910 | 906.5
8405 | 844 | 45 | 405
920.25 | 922. | 922.5 | 920.25

935 | 934.5 | 934
906.5 | 908 | 908
415 | 425 | 42
92075 | 921.75 | 921

934 | 934 | 935
908 | 906 | 908
L | | 43
921 | 921 | 9215

Speed 1 dynamo 5-24
Circuit open and readjust on 5-24 revs
Speed shaft 183
184

184 means

920.25
922.5
920.25
920.75
921.75
921
921
921,5
9212.

927375
921.2 means
2 | 6.175 less
3.087

184 | 2.2648
6.208 | 0.7930
3.0578

1.065 | .0273
1143 feet 3.087 | 3.0851
.4896
3.5747

3757 ft lbs absorbed in
driven the dynamo.

4.5185
3.5747
.9438

8,99

210

.2473
9.3382 -10
.9141 8.2

.9141
T.9542 .9
1.6464
3.4288 2685

4.57185
3.42885
1.0897 12.2 Magnets for H.P.

24.5 23.5 33.5
2 4.5 2
37.5 37.5
√918.75 √918.75 √916.875

.315 30.5 29.5
√915.75 √915.25 √914.75

31
√915.5 915.5 914.5
28.5
914.25 913

The current is left at 2 11
and a current of 8.2 Webers
is thrown on the field, which gives
a deflection of 60.5° which gives,
57° after time

42.2 Magnets for H.P

Shaft 184 revolutions.
185

Machine

918.75	534 revs	
918.75	537 "	
916.75	927.375	
915.75	915.85	
914.75	11.525	lbs diffn
915.5	5.762	
915.5	3.0851	
914.5	5.762 .7606	
914.25	3.8457	
913		
915.850	7010 ft. lbs consumed	
	3757	
	3253	

from machine
with magnet

11/100 (90.909

99

100

99

1000

90.909

909.091

613:
475:
607:
607:
875

613

387 2.5877

613 2.1875

.8002

6.31 Ohms

125 .0969

875 .9420

.1549

1.44 Ohms

31st Circuit closed, machine running 537 revs with 57° deflation from current on magnet

The Elec. Degree 100

The high resistance around a shunt of 1.44 Ohms gave a deflection of 20° or 20 Daniells. The total resistance being 6.31 Ohms.

20 1.3010

Comp 1.44 9.8416 -10

1.1426

6.31 .8000

1.9426

98.3 Daniells .0330

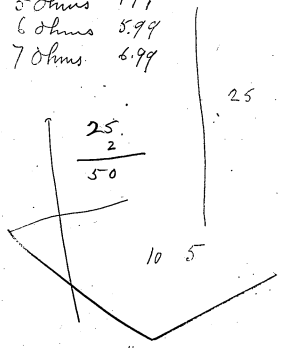
1.0256

106 Volts

Test of Wire in Bridge This for a sliding arm

ohm 1	1000.0 / 911.5 / 88.5	ans .971	88.5 / 911.5	1.9469 / 2.9597 / 2.9872
2	1000.0 / 835.5	ans 1.97	164.5	2.2161 / 2.9217 / 1.2944
3	1000.0 / 771.25 / 228.75		228.75	2.3592 / 2.8873 / .4719
4	1000.0 / 716.5 / 283.5		283.5	2.4525 / 2.8525 / .5973
5	1000 / 668 / 332.		332.	2.5211 / 2.8248 / .6963
6	1000.0 / 625.5 / 374.5		374.5	2.5735 / 2.7967 / .7778
7	1000 / 588 / 412.		412.	.6149 / 1694 / .8445

1 Ohm	.971
2 Ohms	1.97
3 Ohms	2.965
4 Ohms	3.958
5 Ohms	497
6 Ohms	5.99
7 Ohms	6.99



47°

.03034
9.33322
.6971
.6971
1.95-42
1.64 84
2.7948
20

4.98

.623 H.P. lbs

45
4.35
4.26
827.5

455
455
3275

20
45
75
375

19
43
4.26
31

18
475
455
32.75

18
475.
455
32.75

2.35
50
735
3.675

27
50
77
3.6

21.5
50
71.5
35.75

20
47
67
35.5

4.5185
2.7948
1.7237

52.9 Magnets for H.P.

On the magneto 4.98 Webers
that is 47° on the
46° 30'

Use the High Resistance galvo
gave 17.7 D mill on 1.44 Ohms
17.6

Speed of main shaft
186 revs.

8° 4' on Elec Dyne

596
874
604
894
908
698
910
700

829.25
832.75
375
31
832.75
832.75
36.75
36
35.75
36.5
835.40

927.82
874.3
2 | 53.53 lbs
46.176

.18

3.0624
.0273
46.76 1.6702
4.7599

57510

126 2.1004
874 2.9415
.1589

600)400(
.660
1.44

17.7 1.2480
Comp: 1.44 9.8411 - 10
1.0891
6.66 .8239
1.9130

81.8 Danielle in circuit

1.079 .0330
1.9460
88.6 Volts 1.9460
9.1761 - 10
3.0681
44.3 1.6464
4.7145

51,800 ft. lbs given back

57,510 ft. lbs required to drive the machine

Total 6,664 Ohms

.7145
4.7599 Inclusive friction
.9546 90%

57510
3757
53753

4.7145
4.7304
.9841
Exclusive friction
96.3 %.

220

221

$\frac{26^{\circ}4}{2}$

508 revs

44° 30' on Magnet

43° 32

Daniells on Ohms

508 revs.

508 revs

43° on magnet

16.2 Daniells on Ohms

Total

694

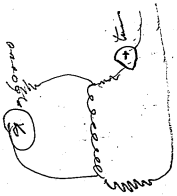
908

698

910

700

222



668
382

223

$$
\begin{array}{r|l}
332 & 668 \\
 & 664 \\
\hline
 & 400 \\
 & 332 \\
\hline
 & 680
\end{array}
\qquad 20.12
$$

$$
\begin{array}{r|l}
243 & 767 \\
 & 729 \\
\hline
 & 280
\end{array}
\qquad 31
$$

$$
\begin{array}{r|l}
248 & 752 \\
 & 744 \\
\hline
 & 800
\end{array}
\qquad 30.3
$$

$$
\begin{array}{r|l}
1635 & 8365 \\
 & 8175 \\
\hline
 & 190
\end{array}
\qquad 51
$$

224

Aug. 8, 1879.

Large Edison, 20 ohms, driving small belted Edison with 0.6 Ohm in armature 1.6 in field 2.2 Total

3.0 on dynamometer

Tests. 1st Insulation of direct high resistance Galv.

2nd Connecting wires in bridge

3rd ~~Rotation~~ Armatures and magnets on both machines armatures in all positions.

4th the Constant of Tan G. al in the place it is given. Instrument is now thought to

225

and the Shunt. This is the sine of deflection for 1 Weber

5th Constant of Dynamometer. This is the square root of the deflection for 1 Weber.

Then test the E.M.F. at various speeds with large resistance, and strong magnets

The same large resistance and varying strength of magnets at medium speeds say 500 or 600 revolutions

Then with strength of current on magnets such that 150 Volts may be obtained at 600 revs about diminish the resistance and measure the E.M.F.

2.4 Constants of Instruments

111 / 50 × 5 Daniells in Shunt

over 2.04 ohms

11.1 Daniells

Connections not examined

11.1	1.0453	
1.08	0.0334	
comp 2.04	9.9904	
	.7691	

587 Webers

44° 30' tan

tan 44° 30' = 9.9924
.7691
9.2233 9° 30'

The tan. placed near some masses of iron which change its constant

9.9924
7957
9.1972

Elec Dyne Constants

1° 30' = Def (1)

air 1° 30'

8.4179
4.2089 −10
.7694
3.4398
2.4398 = Constant

8.4179
4.2089
.7952
3.4137 Constant
2.4137

$\frac{11.5}{50} \times 5$ (1)

2.07 − .08 = 1.99 Ohms

Connecting wire .08 Ohm

Insulation to high resistance
300,000 Ohms or more

	11.5	1.0607
	1.08	.0334
Comp	1.99	9.7011 − 10
		.7952

6.24 Wicks

(2) Tan 42° 30"

= 9.9620
7664
9.1954 cosulan

(2)

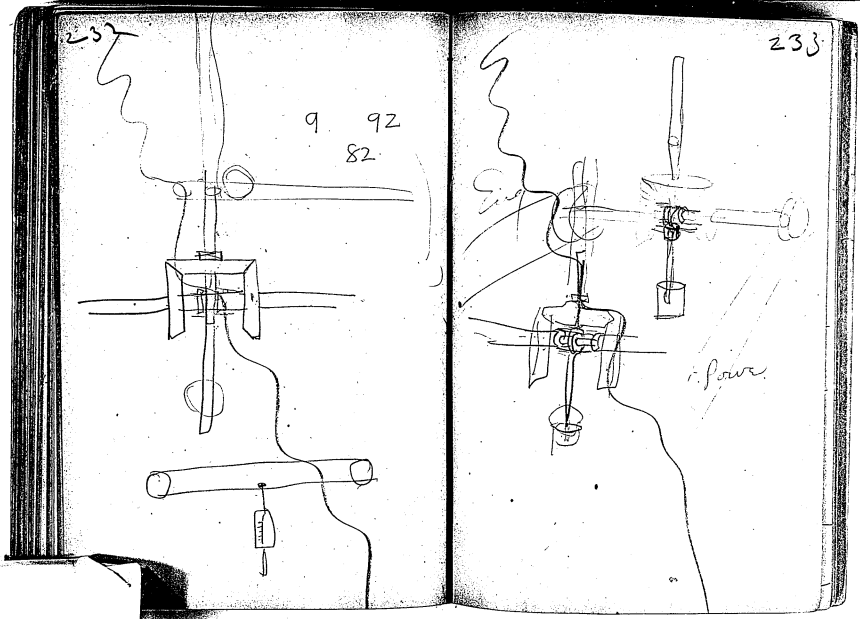
1° 16'

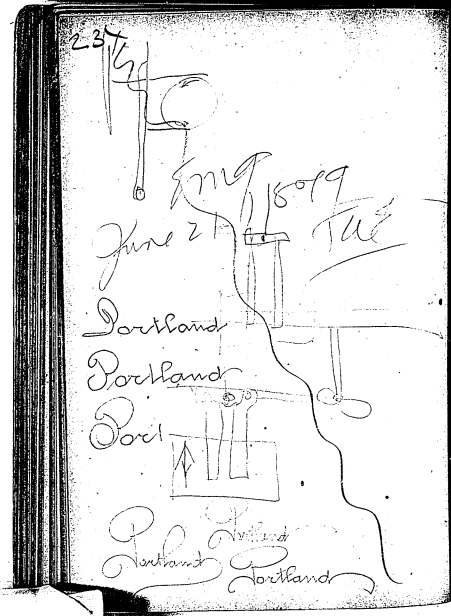
8.3415
4.1707
.7664
2.4043 cosulan

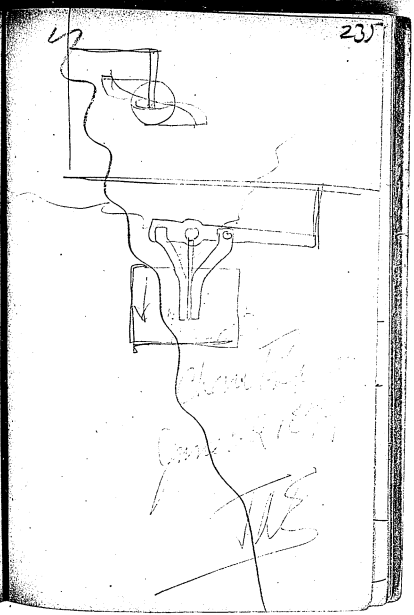
10.6 Daniells (2)

10.6 1.0253 2.04
1.08 .0334 8
Comp 1.96 9.7077-10 1.96
.7664 5.84

page 246


232
9 92
82
233
Sig
i. Soure


June 21 1899
Portland
Portland
Portland
Portland
Portland



Plan of tests.

Errors in last tests to be avoided

1st heating of coils and not measuring quick enough after the current has ceased passing.

This may be in a great measure avoided by using the new coils in multiple arc. 50 coils $\frac{3}{5}$ Ohms each.

This will allow in multiple arc of 3, 16 Ohms in multiple arc of 4

$$\frac{3}{4} \times \frac{50}{4} \frac{25}{2} = \frac{75}{8} = 9.40 \text{hms}$$

For testing on about 237 connect them in multiple of five

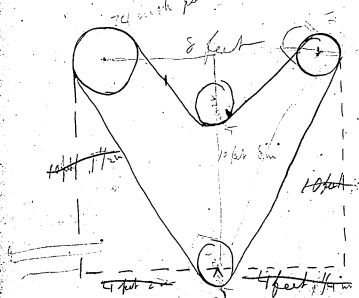
$$\frac{3}{5} \times \frac{50}{5} = 6 \text{ Ohms}$$

$$\frac{3}{6} \times \frac{50}{6} = \frac{25}{6} = 4.2 \text{ Ohms}$$

Arranging the coils in this manner the heating effects should be very small and may be neglected if the measurement of the resistance is taken immediately after the current stops.

The current should then first passed through the coils and at the speed which is required from the machine and

an approximate estimate made of the resistance in the circuit so that when an exact measurement is required it can be more quickly made knowing about what to expect



The Edison Dynamometer

$\frac{\text{Weight taken off}}{2} \times \text{Speed of belt} \times 1.065 = \text{foot lbs}$

High Resistance around Shunt make. shunt. so that it will heat very little then readings can be made without changing it and its resistance be taken as constant; about two Ohms will be right.

Rule divide the deflection obtained by the deflection from the Standard Daniells multiply by 1.08 to reduce to Volts. divide by Ohms in shunt to find no. of Webers multiply by the resistance in total circuit to obtain.

$C = \frac{\varepsilon}{R}$

$R = \frac{\varepsilon}{C}$

$\mathcal{E}^2 R = \varepsilon C$

Volts. Then multiply the Volts by the Webers and by 44.3 to obtain the no of foot lbs. in circuit.

Observer ~~Mr~~

Weights 1st Running belt to machine off

2nd Belt on magnet not made

3rd Belt on magnet made

4th Belt on circuit closed

Deflection of high resistance

Resistance in Shunt 240
in total circuit
see if commutation starts

Magnets
Deflection on tan. Galv.

24 Correction for hills

Page 238

10-9

10

127.5 inches

24.

251.5

125.7 average

50 inches

48.25

9825

49.12 average inches

125.7 — 2.0993 — 3 — 4.1986

15790.

49.12 — 1.6913 — 3 — 3.7826

2413

15798

18203. — 4.2602 — 2.1301

1349 — 2.0993 — .0308 Correction

1075

Page 109

6 feet 3 in

6.25 feet

180	2.2553		
6.25	.7959		
1.075	.0308		
	3.0820		
2	.3012		
480	2.7808	6040	1/2 shed
	24		
181	2.78234		
	24		
182	2.78258		
	24		
183	2.78282		
	23		
184	2.79054		
	23		
185	2.79328		
	23		
186	2.79551		
	23		
187	2.79774		
	23		
188	2.79997		
	23		
189	2.80220		
	23		
190	2.80443		

2xy

246 page 201

$\frac{132}{.50} \times 5^-$

13.2	1.1206
1.08	.0324
1.98	9.7033
	.8573

$\frac{206}{1.98}$

Sin 2° 8′

85708
4.28554
.8573
2.4281

tan 48° 45′

.0570
.8573
9.1997

1. 90

247

$\frac{7.2}{50.} \times 5$ amps

7.2	.8573
108	.0324
#97	9.7055
	.5962

$\frac{205}{8}$
$\frac{}{19.7}$

3.95 Watts

tan 34° 30′
34° 15′

9.8344
.5962
9.2382

248

45 Danielles
1.08 .65532
1.96 .02134
9.90777
.3943

204
8
1.96

22° 30' 9.6172
.3943
9.2229

249
205

5.4 .7324
10 8 .0334
1.97 9.7055
0.4713

26°30' 9.6977
1.4713
9.2264

3.8 5705
1.08 .0334
1.98 9.7077
.3209

19° 30' 9.5490
.3232
9.2232

.75	8751
108	.0334
196	9.7077
	.6162

34° 9.8289
.6162
9.2127

Tan. list.

9.2127
.2282
.2264
.2229
.2282
11.1284
9.2256 9° 32'

Elsie Dynes

.4043
14137
.4281
11.8461
2.4154

252

270 revo
275 revo of machine

34° 30'
33 30.

9.8371
9.2256
.6115

4.08 Webers on magnet

408 .6115
.6115
443 1.6469
218694

740 ft lbs on magnet

4.5185
2.8694
16491

44 magnets for H.C.

253

5.8 .7634
1.08 .0334
Amp 7.12 9.1475
9.9443
T.9443 .879 Webers

66 Ohms total

T.9443
66 1.8195
1.7638

5.8 Volts

44° 30'

44° 15 9.9886

10.9 1.0374
1.08 .0334
2. 9.9990
0.7698 7.41

16.0 1.2041
1.08 .0334
2.02 9.6946
.9321 8.55

Elec. Dyne

1° 20'

3° 15'

256

40° 18' | 8.8749
4.4374
.9856
.4484

18.4 | 1.2648
1.04 | .0334
2.04 | 9.6904
.9886

4° 28' | 2 | 8.8914
4.4457
.9975
1.2695
.0334
1.04
2.02
9.6948
.9975

2.4482

257

10.0 | 1.0334
1.08 | 9.6946
.7240

1° 16' | 8.8345
.1728
.7240
1.4548

12.1 | 1.0825
9.7280
.8105

05.0' | 8.5055
.4158
.7247

258

$\bar{1}.4136$
.4446
.4488
.4482
.4542
.4417
.2511
$\bar{2}.4419$ Constant of Dynamo. Elec.

.9904
.9904
44.21.6464
92 $\bar{1}.9638$
3.5916 3900

4.5185
3.5910
.9275 846 per H.P.

Edison No. 1 Magnet. 92 Ohms
Armature 1.03 2.07
4° 12' 18.8647
$\bar{1}.4323$
$\bar{2}.4419$
.9904

9.78 Webers on magnet
275 Revs.

9.1	.9590
10.85	.0334
11.2	8.9508
	9.9432
	$\bar{1}.9632$ .858 Webers

66 Ohms 1.8195
$\bar{1}.0232$
1.7927
57.9 Volts

Rev 35-8 revs

115

$\frac{115}{91} \times 57.9$

1.7627
2.0607
8.6410
1.8644

73.2 Volts

529 Revs.

$\frac{165}{91} \times 57.9$

1.7627
8.0607
2.2175
2.0409

109 Volts

Edison No. 2 - 261

Magnetic 1.42 Ohms
Armature .56 Ohms
.58 Ohms

3° 18'.

8.67 Webers

.9382
.9882
1.6434
.42 .1523
3.6721

4.5185
3.6721
.8464

262 334 No. 2 Edison revo

Daniells

11.1

8.88	.9128
1.056	.0234
11.1	8.9547
	1.9059

.796

.80 1.9031
1.9009
1.9040

6 3 Volts

504 revo

243

128
8 X 6 3

1.8040
8 0872
128 2.1072
1.9168

99.6 Volts

264

748 revolutions

183 / 68 = 6 S

1,8040
8.3872
2,26225
2.15517

14.1 Volts

1005 Revo

240

1,6040
8.3872
2.3602
2.2714

186 Volts

Changing the [illegible] 265

195 revo.

6° 19'

2/90415
4

The machine "hunted" Probably the cord around the armature caught in one of the pole and [illegible] it was so at 1:30 P.M. the test ceased. The [illegible] were made for [illegible]

Sewing machine Motor

Magnet 6.9 ohms Now 5.8 Ohms!

Armature 3.9 Ohms

Armature

3.9 . . .
2.85
1.85 cross
2.3
3.97
4.72
5.2
5.5 Cross
5.45
5.1
4.42
2.75
1.52
.85
.85
2.27

The armature cotton 267
off and the coils separated
from the commutator
Two cross joint. Again con-
nected and tested out in which
the wires came. Two shorts
Crossed each other beneath
the commutator insulated
all right Resistance of
Armature = ~~5.8~~ 5.12
5.26

Lunny Machine Works Sept. 5.

37° on tan

speed 2200 - 2500 running free.

2 volts on resistance of 6.2 Ohms 4/2 wires

6.08

300 C.P. / 26 Bos × 5 Daniells on machine motor

2.9	.4624
6.08	.7839
.499	T.6785

300	2.4771	
comp 26	8.5850	
5	.6990	
	T.7611	57.69 Dan
1.08	.0334	
	1.7945	62.3 Volts

27 = 5 Daniells

255 total motor

5-4 volts on motor

50 over 5 Dan

10 volts

.499	T.6785
.499	T.6785
6.08	.7839
44.3	1.1454 61.24
	1.7863

61.28	1.7873	
62.3	1.7945	12.6
comp 2.9	9.5316	
	3.1194	

45185 / 3.1194 / 13991 · 1/25 Horse power

13.11 H.P.

for total

270

Magnet 6.9
Armature 5.26
12.16

6.08 : 12.16 :: 61.26

61.26 1.7867
12.16 1.0848
Comp 6.08 9.2161
2.0876

122.2 ft lbs in resistance of machine

1311
122.2
1188.8 ft. lbs in work

~~3.0749~~
4.5185
3.6799
1.4386 2714 per H.P.

Motor running true.

271

10 : 1
6.08 : .7924

0.2076 1.61 Watts
6.2076
.7924
49.2 1.6464
2.8540 714.5 ft lbs

10 : 1 :: 714.5

2.8540
1.7076
9.
3.5616 3614 ft. lbs.

12.16 1.0848
Comp 6.08 9.2161
714.5 2.8540
3.1529 1433

3614
1433
2181 ft lbs

4.5185 1
2181 / 3.13387 1 H.P.
1.1798

272 The large Edison mot.

Cos 37° 9.8771
Log 12° 15' 9.3367
1.5404
3.4 1.5404
44.5 1.64644
1 9.95542
2.7218
527 ft lbs
3 Webers 4.5185
2.7218
1.7967

Sewing machine motor No. 1
Oct. 21 1879.
Magnet 5.7 Ohms
Armature 5.1
10.8
Total 10-9
25 Coils

273

Sewing Machine Motor No. 1

The large Edison with 3.4 Webers in the field
527 ft. lbs.
62 magnets per H. P.

The motor has
Resistance 6.9 Ohms magnet
5.26 Ohms armature
12.16 Total

In circuit with the motor as placed 6.2 ohms
11.2
6.08 ohms

An E.M.F of 2.9 Volts was found active on this when motor was running free
2.9 .4624
6.08 .7839
.6785 .477 Webers

.477 Webers circulating

Motor running free
Around the machine was 271
found an E.M.F of (as per log)
62.3 Volts.

On the 6.05 Ohms resistance
with .477 Webers circulating
61.28 ft lbs. are given
off per minute

The the fall in Emf over
the resistance, is to the fall
in Emf around the machine
as the work given off from the
resistance is to the work given
off by the machine

.2.9 : 62.3 :: 61.28 : X

X = 1317 ft. lbs
That is the total amount
consumed in the machine.

1.7945
1.7874
9.5376
3.1195 1317

.7868
1.7874
9.2171
1.7913 6%

4.5185
3.0772
1.4413

1194. 3.0772
1317. 3.1195
.9577 90.7

Resistance 6.08 Ohms
Motor 12.16
Machine 1.
19.32 1.2861
.1477 1.6785
.9646

Motor running free

The amount consumed by the resistances of the machine would be proportional to sum of resistances

6.08 : 12.16 :: 61.28 : X

X = 122.56 ft. lbs

1317 / 122.56 = 1194.44 ft lbs consumed in work

1 / 27 H.P

90.7% of the energy entering the motor is turned into work

The E. M. F. active in the circuit is the product of the total resistance and the current

That is 9.2 Volts

62.3
2.9
.147
6567
9.2
56.47

1
amp 6.08 | 9.2161
0.2161
0.2161
.7839
1.6464
2.8635

Motor running free
The centrary E.M.F. of
motor at 2200 - 2400
about 56 Volts

2nd Exp. The wheel of the
motor held as in first
position on it and make
it do ~~one~~ more work;
page 269 10 Volts across 6.08 Ohms
$\frac{10}{6.08} = 1.64$ Webers
circulating or 730 ft. lbs
per 6.08 Ohms.

730
51
730
3650
3723.0

5185
3.5694
.9491

1/9

2263 | 3.35-41
3723 | 3.57105
.7836

4.5185
3.35-41
1.1644

around motor 51 Volts

Then 10 : 51 :: 730 : X

X = 3723 ft. lbs total on motor.

6.14 : 1 :: 730 : X
2
1460

X = 1460 on motor

in motor

∴ 3723
1460
2263 ft lbs work in motor

60 % of power entering motor given off as work

1/4 of a H.P given off as work

19.32 1.2861
1.64 0.2161
1.5022

61
1.64
62.6
3117
31

Active E.M.F.
about 31.7 Volts
Contrary E.M.F.
about 31 Volts

84 No field no current.

3029 ft. lbs.
to run machine with
commutator on
page 125

2.120 ft lbs
to run machine with
commutator off.

$\frac{41}{2}$ $\frac{514}{2}$ $\frac{257}{2}$ $\frac{128}{2}$

18' 6.25

20 X 1175 X 1.065 =
2350 20
23500 X 1.065 = 25027.

log	44.3	1.6464
log	1.08	0.0334
log	1.065	.0273

2.0000
1001